RESTORATION ADVISORY BOARD MEETING NAVAL WEAPONS INDUSTRIAL RESERVE PLANT (NWIRP), BETHPAGE TOWN OF OYSTER BAY, BETHPAGE COMMUNITY CENTER 103 GRUMMAN ROAD WEST, BETHPAGE, NEW YORK WEDNESDAY, NOVEMBER 15, 2017

The Forty-first (41st) meeting of the Restoration Advisory Board (RAB) was held at the Bethpage Community Center in Bethpage, New York. Meeting attendees included representatives from the Navy (Lora Fly, Melissa Forrest, Todd Lyman and Joe McCloud), The Management Edge (Gayle Waldron), United States Environmental Protection AGENCY (USEPA) (Lorenzo Thantu), New York State Department of Environmental Conservation (NYSDEC) (Walter Parish, Jason Pelton, Don Hesler and Martin Brand), New York State Department of Health (NYSDOH) (Steve Karpinski), Nassau County Department of Health (NCDOH) (John Lovejoy), Hempstead Water District (John Reinhardt), KOMAN Government Solutions, LLC (Greg Pearman), Bethpage Water District (BWD) (Sal Greco, Terri Black, and Michael Boufis), Massapequa Water District (MWD) (Stan Carey, Thomas Hand, Raymond Averna and Joseph Tricarico), South Farmingdale Water District (SFWD) (Ralph Atoria), Tetra Tech (David Brayack, Melissa Cushing and Kristi Francisco), Nassau County Legislature (Laura Schaefer and Rose Walker), New York Senate (Arthur Anderson and Garrett Armwood), Town of Oyster Bay Supervisor (Joseph Saladino), Town of Oyster Bay (John Caruso, Rich Lenz, and Matt Russo), New York State Assembly (Laura Curiale), Bethpage Community Council (Tom Frost) and Resolution Consultants (Farrell Bell, Brian Caldwell, Vincent Varricchio, Eleanor Vivaudou, and Michael Zobel). RAB members in attendance were Edward Olmstead, Bill Pavone, Sandra D'Arcangelo, and Jeanne O'Conner. There were approximately 51 residents from Bethpage and neighboring towns in attendance. A local newspaper and television news were also in attendance. The meeting sign-in sheet is provided as Appendix A. The Agenda and Definitions are provided in Appendix B.

OPEN HOUSE SESSION, LEGISLATORS AND BWD SUMMARY

Prior to the start of the meeting, an open house session was held. The public was invited to peruse the information provided and ask questions to the Navy representatives, contractors, and regulators. A copy of the posters displayed during the open house is presented in Appendix C.

WELCOME AND AGENDA REVIEW

The Navy representative, Ms. Lora Fly, welcomed everyone to the RAB meeting and presented the meeting agenda. Ms. Fly also introduced Ms. Gayle Waldron (The Management Edge, serving the role of facilitator in support of the RAB) who then went over the Rules of Conduct to ensure that everyone is allowed the opportunity to

comment. Ms. Waldron introduced Mr. Bill Pavone fulfilling the role of David Sobolow, the RAB co-chair, for this meeting.

Ms. Fly introduced the four RAB members present and explained that they are the interface between the community, the Navy and the regulators. Ms. Fly asked if the prior meeting minutes are acceptable as presented. Bill Pavone stated, he did not receive the RAB minutes and Ms. Fly tabled the minutes.

OPERABLE UNIT 2 - OFFSITE GROUNDWATER INVESTIGATION AND WELL CONTAINMENT ANALYSES UPDATE

Safe Drinking Water for residents:

Mr. Brian Caldwell, Resolution Consultants, presented slides explaining the water is safe to drink. Mr. Caldwell reviewed the groundwater cycle and how the raw groundwater is tested and treated by the water districts before it is delivered to the home. The treated groundwater meets all Safe Drinking Water Act requirements before it is distributed.

OU2 Offsite Groundwater Investigation:

Mr. Caldwell, presented the offsite groundwater program objectives. Mr. Caldwell reviewed the local groundwater geology and its applicability to the plume and presented the vertical profile borings (VPBs) and groundwater wells that have been installed and sampled since 2009. He described work performed since the last RAB meeting, future work to be implemented and recent reports with their respective results. Mr. Caldwell reviewed the recent trends in RE108 Area Hotspot groundwater from quarterly groundwater sampling and provided an update for the South Farmingdale Water District and New York American Water Well Containment Analysis. The presentation is included in Appendix D.

VPB and Well Installations:

Work performed since April 2017 includes: installation of three monitoring wells (associated with VPB143, located north of Hempstead Turnpike), installation of four VPBs (VPB143, VPB166, VPB169 and VBP170), two rounds of quarterly groundwater sampling, and one round of water level measurements. The results of the recently installed VPB and the quarterly groundwater sampling results were also presented. Anticipated work through November 2018 includes: installation of five additional VPBs (1 north of Hempstead Turnpike Area and 4 north of Southern State Parkway Area) and 10 monitoring wells (4 north of Hempstead Turnpike and 6 north of Southern State Parkway) and continued quarterly groundwater sampling.

Recent Trends in RE108 Hotspot:

Quarterly sampling results were presented on trend graphs in the RE108 Area Hotspot area groundwater for monitoring wells RE104, RE107, RE108, RE117, RE119D1, BPOW5-4, BPOW5-7, TT101 and TT102. Future objectives include the protection of public water supply wells, continued characterization of the Operable Unit (OU)2 plume, and well containment analysis.

Well Containment Analysis Update:

The purpose of work is to identify the well containment zones of the South Farmingdale Water District (SFWD) Plant 6 wells and the New York American Water (NYAW) wells. In February 2017 to May 2017 - water level changes were recorded in key wells south of Hempstead Turnpike. Assuming receipt of requested pumping data from these water districts, groundwater modeling is expected to be completed in the fall and winter of 2017/2018.

OPERABLE UNIT 3 SITE 4 – FORMER UNDERGROUND STORAGE TANKS

Mr. Joe McCloud, NAVFAC, discussed the status of OU3 Site 4- Former Underground Storage Tanks project. Mr. McCloud reviewed the history of the site, the source of the groundwater contamination, and the construction schedule. The selected remedy consists of steam injection, free product recovery, biosparging, and soil vapor extraction. The wells were installed and the remediation system components are onsite. Steam injection and free product recovery are anticipated to begin in December 2017 and expected to operate for eight months. In the summer of 2018 the system will transition to biosparge with treatment to operate for 4 years. Soil vapor extraction will operate the entire time. The presentation is included in Appendix D.

RE108 AREA HOTSPOT TREATMENT SYSTEM

Mr. David Brayack, Tetra Tech, provided a presentation outlining the RE108 Area Hotspot investigation and remediation and the GM38 Area Hotspot treatment system basin rehabilitation project. The presentation is included in Appendix D.

RE108 Hotspot Update:

The RE108 hotspot is characterized by the presence of trichloroethene (TCE) in groundwater at concentrations greater than 1,000 parts per billion (ppb). Mr. Brayack went over the conceptual site model for the hotspot area, plume delineation, elements of the remedial design and the area needed to house the extraction wells and pumping/air stripping equipment. He then discussed water disposal options that are currently under evaluation.

Mr. Brayack also provided a timeline for system design. This included a Phase I 30 percent design that was completed in October 2017. The Phase I system will include an extraction well and double wall piping from the RE108 hotspot to the Navy's existing GM38 Area Hotspot Treatment System. The existing Nassau County (NC) 495 Recharge Basin currently being used for GM38 discharge will also be utilized for the Phase I RE108 Hotspot discharge. The Navy will be scraping the basin in the next few weeks. The Phase II 30 percent design report is anticipated to be completed in early 2018. The Phase II system will include a groundwater extraction, treatment, and discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge.

SOIL GAS INVESTIGATION AND PROPOSED PLAN FOR SOIL, SOIL VAPOR, AND GROUNDWATER SITE 1 – FORMER DRUM MARSHALLING AREA

Mr. David Brayack, Tetra Tech, provided a presentation outlining Site 1 history, contamination, soil gas investigation and the Proposed Plan and path forward. The presentation is included in Appendix D.

Proposed Plan:

Mr. Brayack presented the proposed Soil, Groundwater, and Soil Vapor Remedies for the Site 1 Proposed Plan. The remedies include a reduced permeability cover, excavation and offsite disposal of polychlorinated biphenyl (PCB) contaminated soil and Land Use Controls for the Soil Remedy; monitoring and Land Use Controls for the Groundwater Remedy; and soil vapor monitoring, Land Use Controls, continued operation of the Soil Vapor Extraction (SVE) Containment System, and installation of additional soil vapor extraction wells for the Soil Vapor Remedy.

Mr. Brayack also announced that the comment period would start next Wednesday. November 22nd and a public meeting is planned for December 12th.

QUESTIONS AND COMMENTS

Following the technical presentations, the meeting was opened for follow-up questions and discussions. The discussion questions and answers are below:

Prior to the discussion questions, Mr. Bill Pavone standing in for the RAB co-chair, David Sobolow, invited the Town of Oyster Bay Supervisor (Joseph Saladino) to address the community.

Mr. Saladino addressed the community concerning the amount of time it has taken to clean up the Navy and Northrop Grumman (NG) Plumes and demanded full hydraulic containment of the plume. He stated that recent projects by Northrop Grumman have been reviewed and authorized by the Town of Oyster Bay only after addressing the concerns of our local residents. Placing restrictions on Northrop Grumman and their contractors to protect our environment, welfare and surrounding community. He also stated that the Town has approved shared use of the GM38 property by Northrop Grumman and the Navy and how they have met with the Navy to discuss treatment systems and Navy's plans for maintenance of Arthur Ave Basin. The Navy has agreed to provide notice to residents of the proposed basin maintenance activity, prepare a traffic management plan, haul route, routine sweeping and performing maintenance on an annual basis moving forward. The Town has also directed the Navy to peruse alternatives for treatment system discharge such as the installation of injection wells. The Town will work with Navy to ensure residents and environment are protected.

Individual questions and responses during the meeting are as follows:

- 1. Does the Navy have a plan to pump water from the area of Hempstead Turnpike north to LIPA/LIRR right of way? This would eliminate siting of large procession in residential area. Mr. Brayack responded that groundwater flows from north to south. Therefore the preferred method for discharging the water is to the south. Discharging the water to the north would either push the plume to a new location and/or require a much higher extraction rate.
- 2. Does groundwater from in the vertical profile boring and monitoring well get tested for radiological contamination, and if so has it been detected. Mrs. Fly responded that radiologicals are not one of the contaminants that the Navy tests for in the vertical profile borings and monitoring wells.
- 3. Are there any plans to undertake universal testing of indoor air in homes for radon? Steve Karpinski with the NYSDOH answered that there are no plans to conduct this testing. He stated that radon is naturally occurring and is separate issue from the volatile organics that are being discussed.
- 4. There has been an increase in the area of copper pipes springing pinhole leaks over the past few years? Is there anything being added to the water that would cause the copper pipes to corrode and leak? Mr. Richard Humann of H2M answered that pinhole leaks in copper piping are not related to groundwater contamination. Water is a natural solvent that is corrosive and can corrode the piping. There are several conditions that could cause the leaks, including stray electrical current, solder, pH, hot water, and different kinds of pipes. There is not

- enough specificity to conclude that groundwater additives or contamination is causing pinholes.
- 5. Do the remediation well pumps operate continuously, 24 hours a day 7 days a week? Mr. Brayack indicated that the pumps normally run 24 hours per day, 7 days a week. The well pumps get shut down periodically for maintenance and power outages. Operation of the wells are tracked and published on the Navy website.
- **6. If I can't sell my house will the Navy or Northrop Grumman buy it?** Ms. Fly indicated that this a legal question and she cannot answer it.
- 7. Does soil contamination have anything to do with any water contamination?

 Mr. Brayack answered that most of the contamination found in groundwater was once present in the soil, perhaps decades ago. In the late 1990s and early 2000s, the Navy operated a remediation system at Site 1 to eliminate a continuing source of groundwater contamination.
- 8. Is the current extent of the groundwater plume within the capture zone of hydraulically down-gradient public water supply wells? How many supply wells are at risk? Mr. Caldwell indicated that the downgradient extent of the wells with detections is just north of Southern State Parkway. It is uncertain whether these wells are within the capture zone of SFWD Plant 6 or NYAW.
- 9. How fast is the TCE (trichloroethene) in groundwater moving based on available data? Mr. Caldwell answered that groundwater moves at about one foot per day, but that TCE doesn't necessarily move as fast as groundwater.
- **10.Who is conducting the water testing from the vertical profile borings?** Ms. Fly stated that Resolution, a contractor to the Navy, is collecting the samples. A private laboratory (Katahdin Analytical) performs the analytical testing under direction from Resolution.
- 11. One RAB member asked; when will Navy stop testing and clean the contamination? Ms. Fly stated testing needs to be continued in order to track the groundwater plume and determine if/when and where treatment would be required for water supply plants. This approach was outlined in the OU2 Record of Decision (ROD). As presented earlier in the RAB meeting, the Navy is designing two hotspot treatment systems Phase 1 and Phase 2. Currently, the Navy is working with property owners to get access so construction can start.

- **12.Can the drilling and pumping of groundwater cause ground damage/sink holes?** Mr. Caldwell indicated that because the soil is highly compacted, there is no significant risk from the ground collapse or sinkhole formation when drilling vertical profile borings.
- **13.When is the recent well and piping installed on Williams Street going to be hooked up to start treatment?** Mr. Pavone stated he has been attending Northrop Grumman meetings and thinks they are close to starting. Jason Pelton with NYSDEC added that he had met with the Northrop Grumman Project Manager that afternoon and he indicated that the 3rd well has been installed and remediation should start in 2018.
- 14. Is the Navy or NYSDEC going to address the Radium found underneath the schools in Bethpage? Recently Bethpage schools found a large amount of Radium. Is this being monitored? Mr. Brand stated NYSDEC is looking to Northrop Grumman to provide radiological records. NYSDEC has also performed field scans at the Bethpage Community Park and school properties and did not find anything of significance. NYSDEC has also sampled the groundwater wells at the schools. Although there were some detections in wells at schools, it was not a public health risk. NYSDEC is putting together all of the information.
- 15. Are radium 226 and 228 being tested for? Mr. Brand indicated that NYSDEC has been testing groundwater in the area for radium, including wells within the plume and the surrounding area. NYSDEC will also submit a report after Northrop Grumman data has been reviewed. He added that NYSDEC has not done extensive radon testing in the area, but there was radon testing associated with the schools and the radon was below levels of concern in the air samples.
- 16. What testing is being conducted for 1,4- dioxane in relationship to TCE? Martin Brand answered that NYSDEC has found a correlation between 1,4-dioxane and certain solvents, such as, 111-trichloroethane (TCA). The governor has created a drinking water quality council charged with looking at emerging contaminants, such as 1,4-dioxane and setting enforceable standards. Currently, there is no enforceable standard for 1,4-dioxane. Ongoing work with Navy and Northrop Grumman will need to consider 1,4-dioxane into the treatment systems.
- **17.What is the Navy doing to clean up 1,4-dioxane from the aquifer.** Mr. Brayack answered 1,4-dioxane is being tracked as an emerging contaminant. He added that the levels currently in the groundwater are below an equivalent state standard of 50 ppb. The GM38 Treatment System, which is currently running, and the planned

Phase II RE108 Treatment System contain low levels of 1,4-dioxane. Treatment requirements will be determined once the state and/or USEPA establish a standard. However, the Navy is conducting a treatability test to determine which systems are capable of removing the 1,4-dioxane from the groundwater prior to discharge.

- 18. What is the quality of the water from the GM38 Treatment System entering the Arthur Avenue Basin? Mr. Brayack answered the treatment system consistently meets all the drinking water standards. In addition, the treatment system generally contains concentrations that are non-detect at 0.5 ppb, or 1/10 of that drinking water standard.
- 19. There was a question regarding NYSDEC and a Natural Resources Damages claim. Ms. Fly answered that NYSDEC, Navy, and Northrop Grumman will discuss this claim.
- **20.** Does the Navy test for radon when testing for volatile organics in the vapors? The Navy responded that they are not testing for radon.
- **21.Why hasn't there been a radiological cleanup for this site?** Mr. Brand stated that NYSDEC is reviewing the information, and will make a determination as to the need for that (i.e. elevations of radiological contamination above background) once that is complete.
- **22.**Could you have stopped the RE108 Area Hotspot north of Hempstead instead of south of it. Mr. Brayack stated if the Navy knew about the hotspot 20 years ago then, yes. As an example the GM38 area hotspot which is further east was identified in the 1990s, treatment started in 2009 and continues to operate.
- 23. Why does it take permitting so long? Mrs. Fly answered the Navy has a process for putting in vertical profile borings, wells, and treatment systems. The Navy has to draft an access agreement then the town puts it in front of their board, their board votes on it and the Navy can begin drilling or constructing. We currently have several requests in place that we are waiting on. The Navy is works with the towns and land owners to make sure this gets done as quickly as possible.
- **24.When will the full remediation of the groundwater plume begin?** Mrs. Fly answered the schedule dates are in the RAB meeting information packet.

- 25. Will high incidences of pinhole leaks in copper pipes affect homeowners insurance in the future due to increased claims? Bill Pavone said he thinks each person would have to speak directly with their insurance company.
- **26.What testing is being conducted to evaluate radionuclides in groundwater used as drinking water?** Mr. Brand stated radon is a gas so it's not tested in the groundwater. A lot of the water districts across Long Island test for radium, which is part of their routine. The results are available in their water quality reports.
- **27.Could the outpost wells be tested for radionuclides?** Mr. Pavone said to ask the water districts.
- 28. Sampling data shows TCE in RE115 at 250 ppb, what measures has the Navy taken to remediate this contamination so far south of Hempstead Turnpike?

 Mr. Caldwell answered that this well is part of the area undergoing aquifer testing and modeling to determine the effects of the capture zone at SFWD Plant 6 and NYAW. The model will determine the actual extent and how SFWD and NYAW wells are able to capture this area.
- 29. What will happen to TCE in RE1115 if the Navy recovery system is not installed far enough south? Mr. Caldwell answered we're taking a conservative approach for recovery well locations and plan that tests capture zones of wells used for recovery will overlap.
- **30.** Is the county pushing for the Navy and Northrop Grumman to reimburse the county, how much has the county spent so far? Ms. Rose Walker stated she feels like every water district should be paid back. She believes that they have spent millions to install filtering systems that normally are not required.
- 31. What if there are radionuclides or other contamination in the groundwater treatment system discharge? Mrs. Fly answered that for the radium 226 and 228, the Navy has worked with NYSDEC to test various wells and has given the data to NYSDEC to evaluate. The Navy is currently waiting on the NYSDEC to summarize the data in order to move forward. Sampling was performed around the GM38 Treatment System in 2013, 2015 and 2016 and that data was also given to NYSDEC.

Mr. Brand added that NYSDEC is asking Northrop Grumman to conduct testing for radium

CLOSING REMARKS

Mrs. Fly thanked everyone for participating and coming to the meeting, stated that the next RAB meeting would be in April, and the meeting was adjourned.

APPENDICES

APPENDIX A 15 NOVEMBER 2017 RAB MEETING SIGN-IN SHEET

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Bill PAUSUS-RAS		•	,
Cindy Rosers	,		
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Mike Boufis			
Greg Curloy			
AINAM GOVERN			
Elayne Candiotte			
JOHN KENNA			
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CLIFF WINTER			

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Clara Kelly			
FRANKSEMMEEN	····		
Alyse Delle-Fave	NO		
Supervisor Joseph Saladin	· ·		
Rich Humann			
THOMAS RALEIGH	···		
MkeHantran	•		
Jeanne O'Connor	•••		
RICH LENS			
Melissa Cushing			
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Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting
Dave Brazock	•		
EleanorVivanda	<u>.</u>		
JOE MICLIONS	,		
Brian Callwell	*		
TAEON TEGON	····		
NICK VALENBURG	<u>/</u>		
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Edward Carroll	<u> </u>		
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SANDRA D'AREANGORO			
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MATTHEW RUSSO	<u> </u>		
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	William PRomano			
	Lucille Romano	·		
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	Tom MCCARTHY	•••		
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	DOHU SULLIVAN	····		
	Garrett Armucol			
	Rich Barrabi	•••		
	Bill Wilkes	••••		
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	JOSEPH FERRANO	s		

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
Don Hesler	···	,	•
ROBANG			
Tom Delia	• • • • • • • • • • • • • • • • • • •		
Raymond Averna	···		
EDUARD OLMSTOD	3		
Paul Lombord			
DENNIS HOLLMANN	`		
Stan Carey			
Janice Pas Cavella			
Istelle Hauck			
Chabeth Regon			
Allw Arderson			
Locishuss			
Tweek Ryns			
MARIO GAITE			
Esthat Marc V. Fale			

Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
LocenzoThaz			
Law Corale			
Mike Zobel			
Joseph /Klosele			
SelJGeeco			
7040 COUME			
Conty Doly Stock Hix			
Peter Schimmel			
Laur Schrech			
Joanne Verro	•		
Deleve Richardon	·		
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Name (Print)	Phone and/or email or address if interested in being on the mailing list	Affiliation	How did you hear about the meeting?
RALPH ATORIA			
MIKE LUKETE			
MARTIN WALSH			
Phil Sadis	*		
Soma Jan			
Lorraine Fugarty			
Larme			
Phil Healey			
TenBlack			
WalthPail			
John Rainhannt			
FRANC KOCH			

APPENDIX B RAB MEETING AGENDA AND DEFINITIONS



Agenda for Restoration Advisory Board

Naval Weapons Industrial Reserve Plant Bethpage

Date: November 15, 2017

Time: 6:30 PM

Location: Bethpage Community Center-103 Grumman Road West, Bethpage NY

Time: 6:30 PM to 7:00 PM

Open house - general questions from the public

Time 7:00 PM to 8:00 PM

- Ground Rules The Management Edge
- Introduction of RAB members and Regulators Navy Co-Chair/Community Co-Chair
- Distribution of Minutes and Status Update Navy
- OU-2 Offsite Groundwater Investigation Resolution
- Site 4 Remedy Navy
- RE108 Hotspot Treatment Tetra Tech
- Site 1 Proposed Plan Tetra Tech

Time 8:00 PM to 8:30 PM

- Questions Community Co-Chair
- Closing remarks Navy

Copies of information can be found at the document repository located at the Bethpage Public Library, 47 Powell Avenue, Bethpage NY 11714 (516 931 9307) or online at http://go.usa.gov/DyXF.

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Distribution:

NAVFAC Mid-Atlantic, Lora Fly

NAVAIR, William Cords

NYSDEC, Bill Fonda

NYSDEC, Don Hesler

NYSDEC, Jason Pelton

NYSDEC (Albany), Steve Scharf

NYSDEC (Albany), Henry Wilkie

NYSDEC (Stony Brook), Walter Parish

NYSDOH, Steve Karpinski

NCDOH, John Lovejoy

USEPA Region II, Lorenzo Thantu

Resolution, Brian Caldwell

Tetra Tech, David Brayack

KGS, Greg Pearman

Community Co-Chair, David A. Sobolow

Community RAB Member, Sandra D'Arcangelo

Community RAB Member, Robert Horah

Community RAB Member, Ethan Irwin

Community RAB Member, Eugenia Mazzara

Community RAB Member, Jeanne O'Conner

Community RAB Member, Edward Olmstead

Community RAB Member, Bill Pavone

Community RAB Member, Irene Shapiro

Community RAB Member, Rosemary Styne

Community RAB Member, Roy Tringali

Community RAB Member, Rose Walker

Definitions and Clarification of Terms, Acronyms and Abbreviations For the Bethpage Restoration Advisory Board (RAB)

Basic:

- O VOC--Volatile Organic Compounds:
 - Chlorinated solvents (typically used as degreasers in manufacturing)
- Effluent
 - Is an outflow of water from a treatment source
- Free Product
 - Substance (usually oil or gasoline) that exists in its own state-it is not dissolved in water.
- Soil Vapors
 - Gases contained in the pore spaces of soil
- Capture Zone
 - Area of water whose flow direction is influenced by pumping
- Ground Water
 - Water flows through open pore spaces of soil
- Down gradient
 - The direction of groundwater flow
- Plume
 - An area that impacts from chemicals are detected in
- Raritan Clay Layer
 - A geologic horizon Clay that is approximately 800-100 feet below ground surface accepted to be the bottom of the Magothy aquifer
- Aquifer
 - an underground layer of water-bearing permeable rock or unconsolidated materials
- Trichloroethylene-
 - Volatile organic compound of concern (used as a degreaser in manufacturing)
- OU- Operable Unit
- BGS Below Ground Surface
- PCB- Polychlorinated Biphenols (used as transformer cooling fluid)
- NG- Northrop Grumman
- NWIRP-Naval Weapons Industrial Reserve Plant
- O No. 6 Fuel Oil-tar
- Hot spot
 - Area where trichloroethylene is at a concentration greater than 1000 parts per billion
- BWD Plants- Bethpage Water District Plants

Data Gathering:

- Gauging- measurement of ground water levels from top of ground surface
- o In-situ in place
- Delineate- define boundaries
- VPB- Vertical Profile Boring
- Monitoring Well- (typically 2-6 inches in diameter) a well used to provide a "snapshot" of water quality when sampled

Treatment Technologies:

- Biosparging
 - Removal of chemicals by breaking them down with bacteria
- Steam Injection/Free Product Recovery
 - Heating of oil that has a tar like consistency with steam to make it flowable (syrup like consistency) so that it may be removed
- Air Stripping
 - Removal of dissolved volatile organic compounds from water by transferring it into air
- Land Use Controls
 - Action that restricts what land can be used for
- Vapor Phase treatment-
 - Removal of a chemical from gas; used to remove trichloroethylene from air vapor
- Biodegradation
 - Reduce a chemical by changing conditions so that bacteria can break down the chemical
- On-site Containment Treatment System (ONCT)
 - Series of wells that remove and treat groundwater at the southern edge of the former Northrop Grumman property
- SVECS—Soil Vapor Extraction Containment System
 - Vacuum for volatile chemicals trapped in the air between soil particles; used to remove trichloroethylene
- Equalization Tank
 - Tank for mixing
- Liquid Phase Granular Activated Carbon Polishing
 - Removal of remnants of a volatile chemical by passing liquid through carbon;
 used to remove trichloroethylene

- Recharge basin
 - Sandy basin that receives storm water and allows water to filter down into the ground
- Recovery Well
 - (Typically larger diameter 12 to 36 inches) a well used to recover oil or water containing chemicals

• Regulatory:

- Proposed Plan- Plan of action that is sent to the state for approval prior to the Final Record of Decision
- Feasibility Study- collection of data used to determine if a remedy will work
- ROD –Record of Decision
- Compliance sampling- collection of samples to demonstrate that chemicals are below regulatory levels
- CERCLA- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – the legal mechanism for cleaning up inactive hazardous waste sites at DOD (Depart of Defense) facilities, this is the defining regulation for the Navy's Environmental Restoration (ER) Program at NWIRP Bethpage under NYSDEC authority.
- RCRA- Resource Conservation and Recovery Act (RCRA) Corrective Action a statutorily required cleanup program, similar to CERCLA, that addresses active solid waste management units and contaminated media as a condition of RCRA permits -NWIRP Bethpage has a RCRA Permit with NYSDEC
- NYSDEC- New York State Department of Environmental Conservation (NYSDEC)
 provides regulatory review and approval of Navy actions at NWIRP Bethpage
- NYSDOH- New York State Department of Health (NYSDOH) assists NYSDEC.
- USEPA- United States Environmental Protection Agency (USEPA) Provides federal review of the Navy actions.

APPENDIX C POSTERS

NWIRP BETHPAGE HISTORY

The primary mission of the Naval Weapons Industrial Reserve Plant (NWIRP)

Bethpage was to research, design, build and test military aircraft in support of our national defense



1941

Northrop Grumman (NG) purchased the property and started production of aircraft during WWII. Later, the Navy and NG exchanged properties, resulting in a 109-acre Government-Owned Contractor-Operated (GOCO) facility and a neighboring 550-acre NG-owned and operated facility

1986

Navy Environmental Restoration Program began - initial studies identified sites on NWIRP Bethpage requiring further investigation

1998

NG returned operational control of the NWIRP Bethpage to the Navy

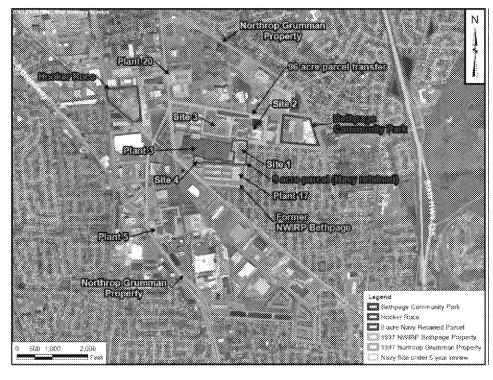
2008

Navy transferred 96 acres of NWIRP Bethpage property to Nassau County for economic redevelopment. Remaining 9 acres were retained by the Navy to complete Environmental Restoration Program requirements.

Present

Environmental Restoration Program work continues at two sites on former NWIRP Bethpage and for off-site groundwater contamination.

ENVIRONMENTAL RESTORATION SITES



Environmental Restoration Complete:

- **Site 2:** Recharge Basins (2002)
- **Site 3:** Salvage Storage Area (2002)

Environmental Restoration Occurring:

- Site 1: Former Drum Marshalling Area
- Site 4: Former
 Underground Storage Tanks
 (USTs)

CLEANUP TEAM



- The Navy's Environmental Restoration Program is conducted to meet requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
- The Navy is the lead agency for environmental restoration at NWIRP Bethpage under CERCLA
- Naval Facilities Engineering Command (NAVFAC) manages the program at NWIRP Bethpage



- The New York State Department of Environmental Conservation (NYSDEC), with assistance from the New York State Department of Health (NYSDOH), is the lead state agency providing regulatory support for NWIRP Bethpage.
- The United States Geological Survey (USGS)
 provides technical support on groundwater issues.



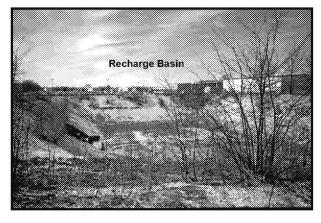
SITE 2 – RECHARGE BASINS

Man-made impoundments

 Collected storm water runoff, cooling water from air conditioning units, and rinse waters from Northrop Grumman (NG) operations

Sludge Drying Beds

 Used to dewater sludge from Industrial Waste Treatment Facility from NWIRP and NG operations



PCBs in Soil

- 7,000 tons of soil removed (1996).
- Soil and gravel cover added (2001)
- Land use controls in place requiring maintenance of the soil and gravel cap and limiting future land use (2002)
- Site was transferred to Nassau County (2008)
- Recharge Basins continue to receive storm water runoff from former NWIRP Bethpage property and former NG property, and treated groundwater from the Bethpage Community Park

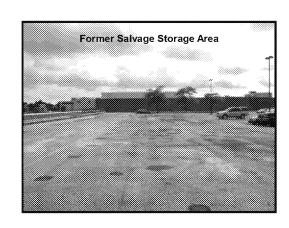
SITE 3 – SALVAGE STORAGE AREA

<u>History</u>

- Used by NG from 1950 to 1969
- Consisted of a parking area, salvage storage area, and three warehouses
- Fixtures, tools, and metallic wastes were stored on site
- While in storage, cutting oils dripped from some materials
- Now partially covered with asphalt

VOCs in Soil

- Low-levels of VOCs in soil
- Clean soil and asphalt were placed over areas of the site to prevent exposure
- Fencing and security measures prevent public access
- Restrictions limiting future use of the site.
- Land was transferred to Nassau County in 2008.



SITE 1 – FORMER DRUM MARSHALLING AREA

Leaching Wells

- Approximately 120 leaching wells underlying most of Site 1
- Received sewage discharge from Plant 3 until 1968

Volatile Organic Compounds (VOCs) in Soil and Shallow Groundwater

- Extraction system removed roughly 4,520 pounds of VOCs between 1998 and 2002
- VOC concentration in groundwater beneath Site 1 reduced by 95%
- Met Cleanup Goals for protection of groundwater, no further action needed to protect groundwater from soil

Drum Storage

- Two areas were used to store drums of waste primarily from Plant 3
 - Chlorinated and non-chlorinated solvents
 - Liquid cadmium and chromium wastes
 - Polychlorinated biphenyls (PCBs)
- · Currently grass-covered field

PCBs, Polynuclear Aromatic Hydrocarbons (PAHs), and Metals in Soil

- Over 100,000 cubic yards of soil has been impacted
 - PCB contamination from the surface to 65 feet deep
- · PAHs and metals also in soil
- Navy is preparing to start a Public Comment Period for the Site Remedy
- Cleanup to start in 2018



VOCs in Soil Vapor

- In 2008, VOC-contaminated vapors were found in off-site soil gas
- Off-site impacts initially addressed by in-home removal actions in early 2009
- Late 2009 a fence line soil vapor extraction containment system was installed on Navy property to:
 - Draw back vapors that had moved off-site
 - Prevents additional soil vapors from moving off-site
- System continues to operate

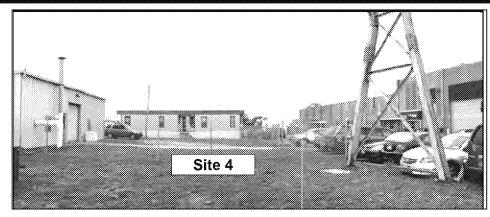
SITE 4 – FORMER UNDERGROUND STORAGE TANKS

Number 4 and 6 Fuel Oil Tanks

- Northrop Grumman (NG) removed the tanks in 1980s
- Contained tar like petroleum product

Petroleum Products in Soil and Groundwater

- Investigations by the Navy indicated petroleum in soils 30 to 71 feet deep, near and below the water table
- Impacted soil covers an area of approximately 0.14 acre
- Minimal groundwater impacts
- Consistent with Site 4 ROD, petroleum is commingled with VOCs



Selected Remedy

- Recover fuel oil free product from groundwater
- · Biodegradation Polishing
- Groundwater Monitoring

Timeline

- Nov 2015 Record of Decision (ROD) signed
- 2017 Started Cleanup
- Anticipated to operate for 2 to 4 years
- Groundwater Monitoring to continue for more than 10 years

Groundwater

Historic storage and disposal practices resulting from Northrop Grumman (NG) operations at the former NWIRP Bethpage site, adjacent former NG-owned properties and other possible source areas have resulted in Volatile Organic Compound (VOC) contamination in the local groundwater.

Operable Unit 2 (OU2) Groundwater Plume:
Over several decades, contaminated
groundwater that originated at NWIRP
Bethpage and NG facilities has moved offproperty, generally to the south and southeast.

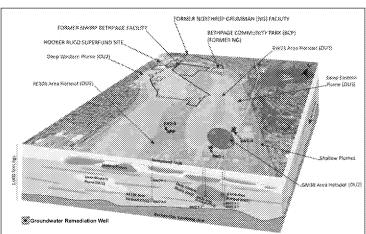
Complex Groundwater Plumes

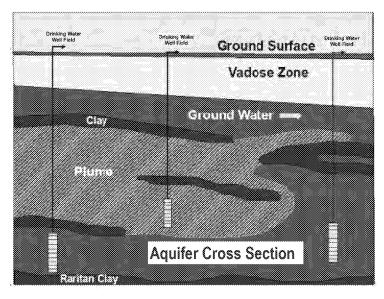
- VOC contamination covers over 3,000 acres
- VOCs are not distributed evenly
- Variety of concentrations at various depths in different areas
- Most of the groundwater is free of VOCs
- Multiple, widely dispersed plumes, or "fingers," throughout the area
- · Drinking water wells alter natural groundwater flow

Shallow Plume: VOCs are located in groundwater approximately 50 to 300 feet deep in a large general area south of the former NWIRP Bethpage and former NG property. This plume is also impacted from multiple small businesses and former septic systems.

Deep Western Plume: VOCs are located in groundwater (deeper than 300 feet) south of the former NWIRP Bethpage site, former NG property, and Hooker Ruco Superfund Site, and continuing south of Hempstead Turnpike.

CONCEPTUAL PLUME MODEL - NORTH OF HEMPSTEAD TURNPIKE





Deep Eastern Plume: VOCs are located in the groundwater (deeper than 300 feet) on former NG property east of the former NWIRP Bethpage site, starting in the area of the Bethpage Community Park (BCP) and continuing south of Hempstead Turnpike (also known as the BCP Plume).

GM38 Hotspot: VOCs were located in groundwater approximately 300 to 500 feet deep in an area southeast of the former NWIRP Bethpage site and north of Hempstead Turnpike. Hotspot treatment is nearing completion.

RE108 Hotspot: VOCs are located in groundwater approximately 500 to 750 feet deep within the Deep Western Plume.

Mapping, management and cleanup of the groundwater are very challenging because of the complex geology, drinking water well field influences, size, depth, and variable distribution of the VOCs.

Navy 2003 RECORD OF DECISION (ROD)

The Navy, with regulator concurrence, issued its federal cleanup and management plan to address OU2 groundwater contamination resulting, at least in part, from the NWIRP operations.

Approved Groundwater Remedy:

- · Legal Restrictions on Groundwater Use
- Groundwater Monitoring and Hotspot Treatment
- Public Water Supply Protection Program

Full Containment of the OU2 Groundwater Plume is not feasible as concluded by a panel of national experts in 2011.

Groundwater Monitoring

PURPOSE

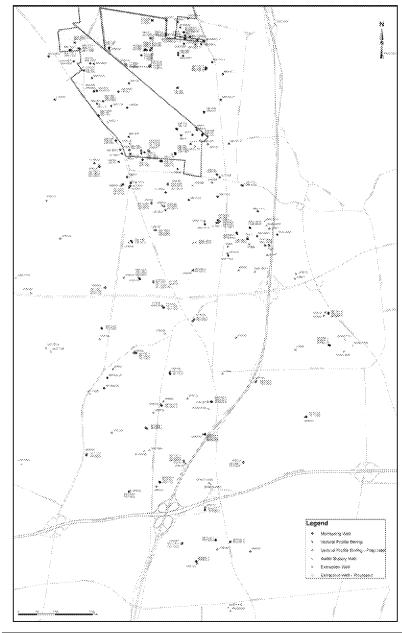
- Determine and monitor groundwater contamination south of NWIRP Bethpage and Northrop Grumman (NG) property
- · Implement "hot spot" remedy(ies) as needed
- Provide wellhead treatment for potentially impacted public water supplies
- Coordinate with NG to help it address its OU2 responsibilities under the 2001 NYSDEC ROD

MONITORING COMPONENTS

- Requires property access agreements
- Vertical Profile Borings (VPB) quickly screen areas for the presence, depth, and concentration of contamination
- Permanent Monitoring Wells (MW) confirm presence/absence of contamination and develop trends
- Water levels measurements support United States Geological Survey modeling and capture zone analysis

Vertical Profile Borings

- Locations selected by the Navy and NYSDEC
- Generally located on township or county right-of-ways
- Advance notification provided to nearby residents
- 12-inch diameter hole drilled into the ground
- Final boring is 860 to over 1,000 feet deep (extending to the Raritan Clay Layer)
- Drilling is stopped at selected depths and a device is lowered to sample the groundwater
- 44 groundwater samples are collected per boring and analyzed for VOCs
- 4 to 8 weeks to complete a boring/well



2000-2017: Navy installed over 55 borings and over 100 monitoring wells. Data is shared with NYSDEC, public, and other stakeholders. Additionally, NG has installed its own borings and monitoring wells that also provide data to the OU2 Program.

HOT SPOT TREATMENT

Hot Spots are areas with greater than 1,000 parts per billion (ppb) trichloroethene (TCE), which is the primary VOC contaminant in the OU2 Groundwater

GM38 Hot Spot

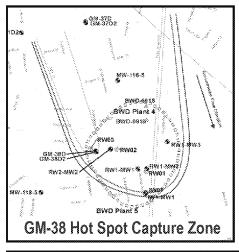
- Approximately 1.6 miles southeast of former NWIRP Bethpage and former Northrop Grumman (NG) property
- Groundwater flows from the former NG and NWIRP facilities to the hotspot area
- · Originally 38 acres in size
- · Variable depths between 300 to 500 feet deep
- Now less than 200 ppb; groundwater concentrations have decreased by over 80 percent

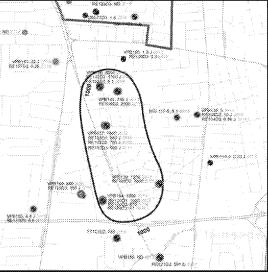
GM38 Groundwater Treatment System

- Installed, operated, and maintained by the Navy in accordance with the Navy's OU2 ROD
- Operated by the Navy since 2009 to remove VOCs in groundwater to achieve drinking water standards
- · Recovery well pulls groundwater to the surface
- VOCs are then removed from the groundwater by air stripping and carbon filters
- Samples are collected from eight monitoring wells to determine the system's effectiveness
- Approximately 3.8 billion gallons of groundwater containing over 5 tons of VOCs have been captured and treated

RE108 Hot Spot

- Identified by the Navy 2011; located north of Hempstead Turnpike
- Approximately one mile south of former NWIRP Bethpage and NG property
- Approximately 500 -750 feet deep
- Additional drilling/sampling planned to the west of RE108
- · Treatment options are being evaluated
- · A treatment system is currently being designed





PUBLIC WATER SUPPLY PROTECTION

Navy works with NYSDEC, water districts, and NG to use groundwater monitoring results to predict potential impacts to public water supply wells and install wellhead treatment systems to remove VOCs down to concentrations meeting drinking water standards

Wellhead Treatment Systems Funded by U.S. Navy

Bethpage Water District (BWD)

- Plant 5 1996
- · Plant 6 upgrades, 2011

South Farmingdale Water District (SFWD)

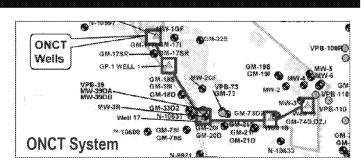
- Plant 1 2011
- Plant 3 2013

New York American Water (NYAW) Seamans Neck Rd,

- Interim system, 2012
- Full scale system, 2015

NORTHROP GRUMMAN ON-SITE CONTAINMENT

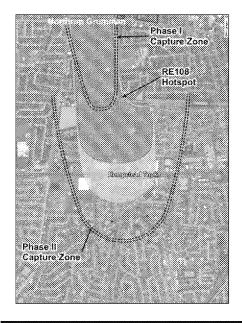
- Captures groundwater at the south and southwest edges of the former NG property to prevent further off-site movement
- System is operated and monitored by NG with quarterly and annual reports provided – Navy has no control over or involvement in environmental cleanup decisions for NG
- · VOC data indicate some contamination may be bypassing the system
- NG evaluated the effectiveness of the ONCT system in 2016 and determined that the system was operating properly.
- Navy is continuing to reviewing data to verify that residual NWIRP contamination is not migrating beyond NG's containment system.



RE108 AREA HOTSPOT TREATMENT SYSTEM

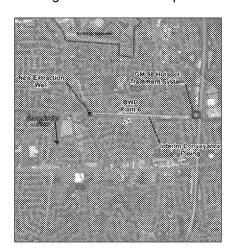
Background

- Navy is addressing the RE108 Area Groundwater Hotspot
- Work is being conducted in 2 phases
 - Phase I located north of Hempstead Turnpike, to address northern portion of the Hotspot
 - Phase II located south of Hempstead Turnpike to address remainder of the Hotspot



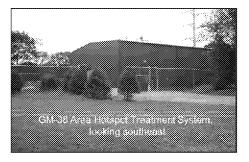
Phase I - Description

- The Phase I System would consist of an extraction well and double wall piping to the Navy's existing GM38 Area Hotspot Treatment System
- Based on property access requirements, design and construction could be completed within 1.5 years
- Operations would reduce RE108 Area Hotspot groundwater migration rate and remove significant solvent mass from the groundwater
- Its operation would also accelerate overall groundwater cleanup times



Phase I - Siting

 The new well and piping would use the existing utility corridor and GM38 Area Hotspot Treatment System

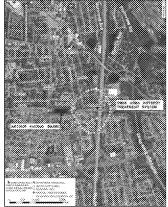




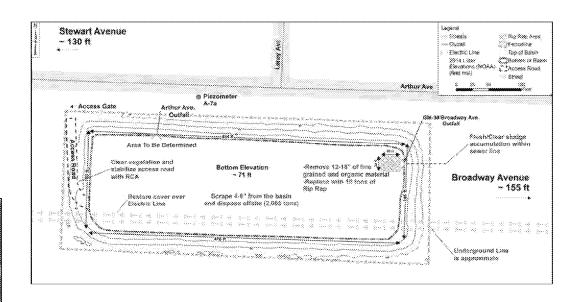
GM38 BASIN REHABILITATION

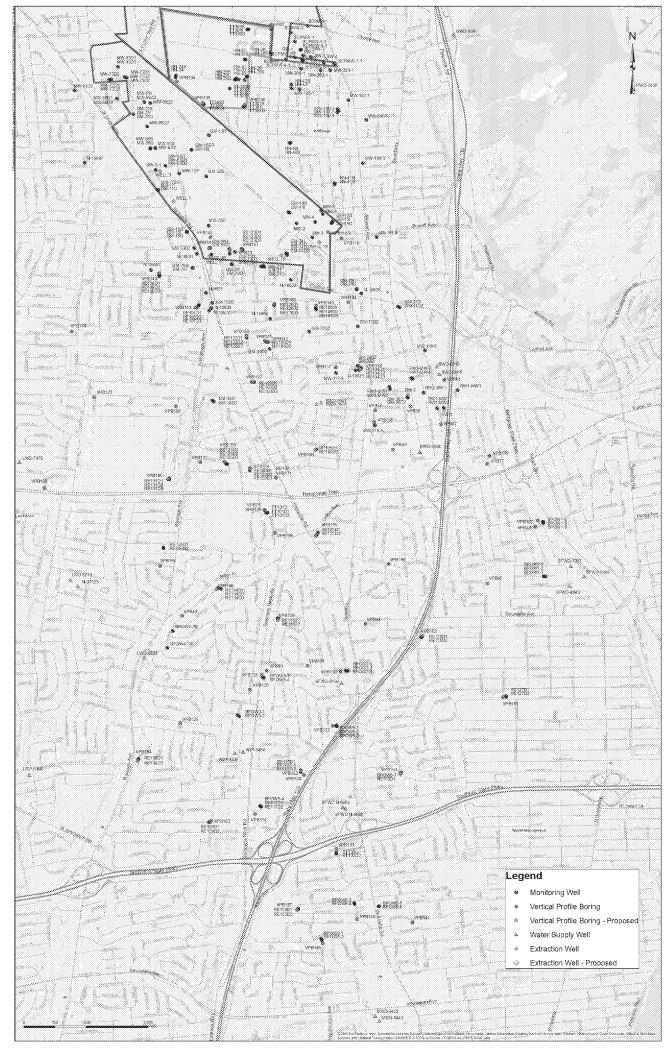
Basin Rehabilitation

• Navy will be cleaning basin in the next few weeks - 2,000 tons of soil and trash to be removed









APPENDIX D PRESENTATIONS



NOVEMBER 2017 RESTORATION ADVISORY BOARD

NAVAL WEAPONS INDUSTRIAL RESERVE PLANT BETHAGE X Z Z Z Z Z

1115/2017

PRESENTATION LAYOUT



Is My Water Safe to Drink?

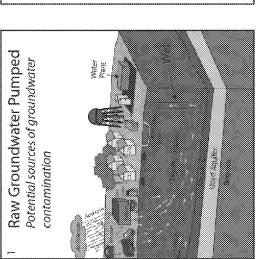
- . Program Objectives
- Local Groundwater Geology and Applicability to Bethpage Plume
- 3. 2009 2017 Vertical Profile Borings and Wells
- Recent Work (Performed since last Restoration Advisory Board)
- Future Work
- Assessing Results and Recent Reports and Findings

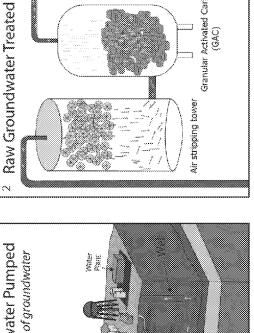
Well Containment Analysis

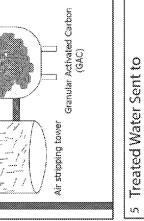
. Update - NYAW and SFWD

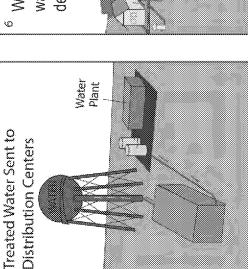
SMY WATER SAFE TO DRINK? LETS TAKE A LOOK!

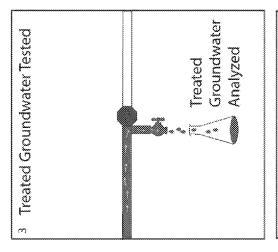


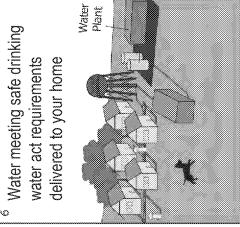


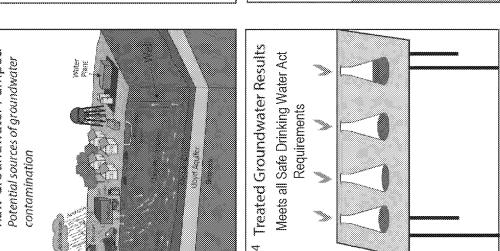






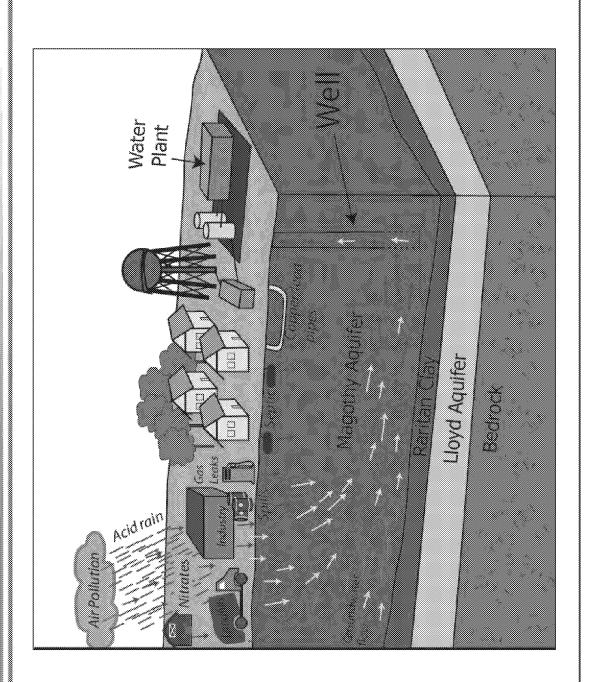






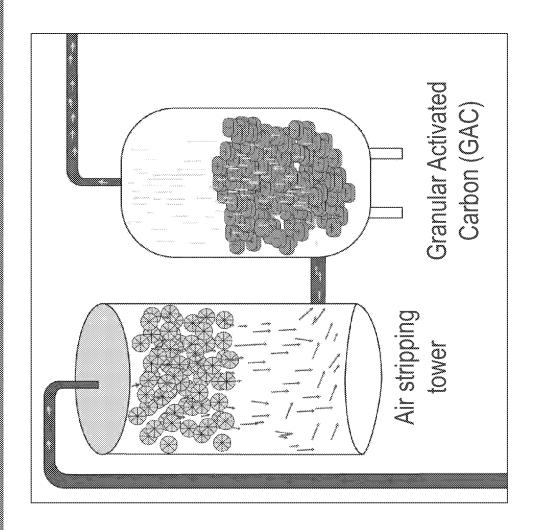
RAW GROUNDWATER PUMPED MAY CONTAIN CONTAINANTS





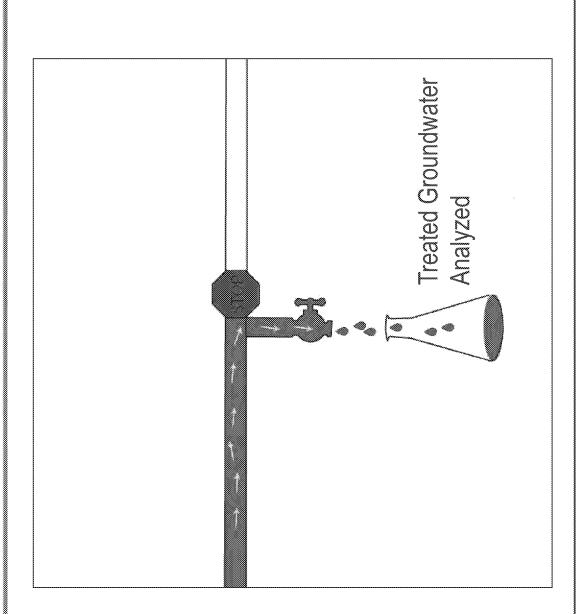
RAW GROUNDWATER TREATED





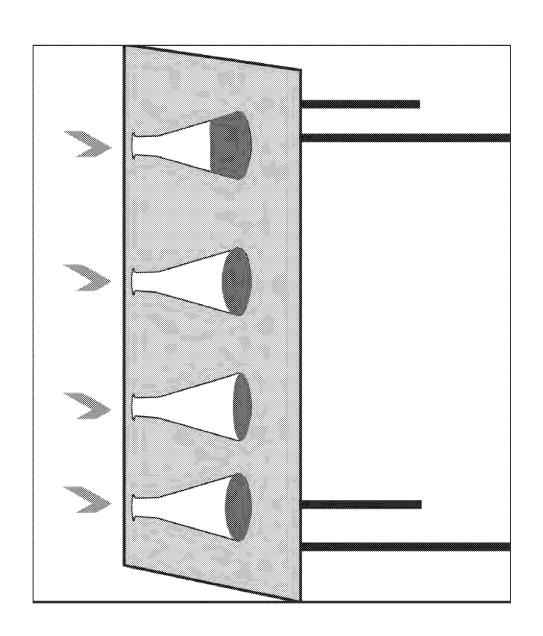
TREATED GROUNDWATER TESTED





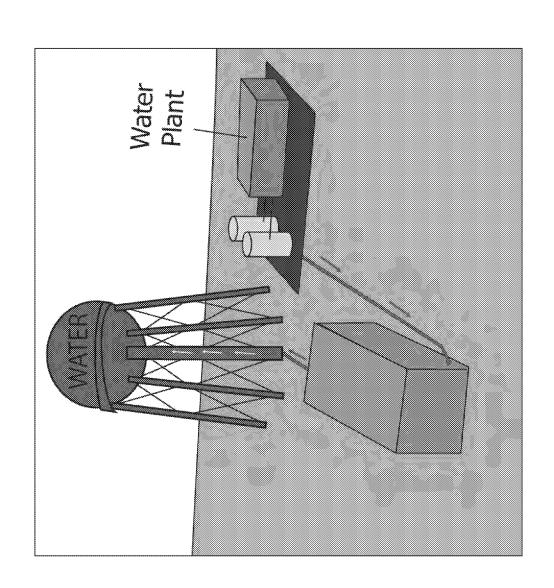
TREATED GROUNDWATER RESULTS MEETS ALL SAFE DRINKING WATER ACT REQUIRENTS





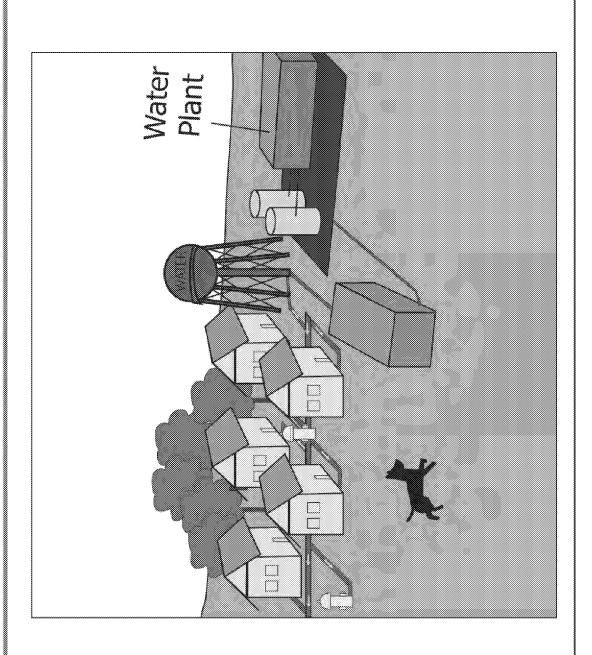
TREATED NATER SENT TO DISTRIBUTION CENTERS





REQUIREMENTS DELIVERED TO YOUR HOME





SESSI



. Protection of public water supply wells -

All currently planned outpost wells are in place and being monitored

Continue to Investigate the OUS Plume -

Installation of Monitoring Wells and Vertical Profile Borings to delineate the overall plume and the RE108 Hotspot;

Quarterly groundwater sampling.

Investigate the degree that supply wells capture contamination -

Pilot Study in cooperation with South Farmingdale Water District (SFWD) and New York American Water (NYAW).

OFFSITE GROUNDWATER INVESTIGATION



Purpose: Delineate groundwater contamination in areas south of Naval Weapons Industrial Reserve Plant Bethpage

Podram Components:

- presence, depth, and concentration of contamination; drilling can take Vertical Profile Borings (VPB) - quickly screen areas for the 4-8 weeks to complete.
- presence/absence of contamination and develop trends; drilling can Installation/Sampling of Permanent Monitoring Wells - confirm take 2-6 weeks to complete.
- Data logging of water levels and Evaluation of Data Support modeling and capture zone analysis for wells.

VERTICAL PROFILE BORINGS (VPB)



- **12-inch** diameter hole drilled into the ground;
- Final boring is 860 to greater than 1,000 feet deep (extending to the Raritan
- Drilling is stopped at selected depths and a device is lowered to sample the
- 44 groundwater samples are collected per boring and analyzed for Volatile Organic Compounds;
- 4 to 8 weeks to complete a boring/well.

11/18/17

VPB AND WELL INSTALLATION PROCESS



- Ideal map location selected by Navy and State;
- Location is then ground-proofed (visual check onsite) by the Navy;
- Drilling rig requires minimum of 100 feet with no overhead obstructions;
- Municipal properties preferred (drainage basins or township right of ways);
- Considerations to minimize inconvenience to residents nearby:
- Health and Safety Concerns
- Ingress and egress
- <u>\$</u>
- Advanced notification to nearest residence

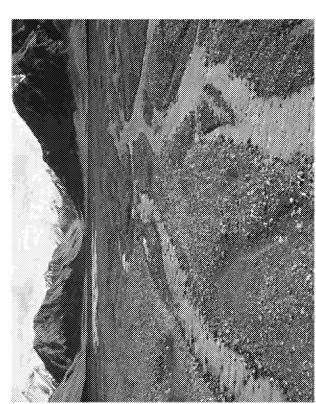


LOCAL GROUNDWATER GEOLOGY



BASAL MAGOTHY AQUIFER

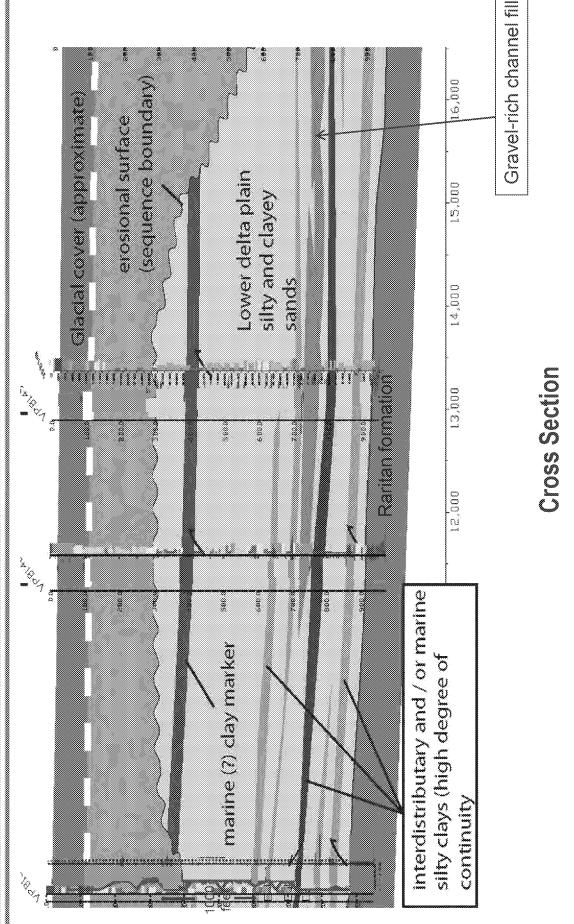
Interbedded clays, sands, and gravels Geologic layers are not the same at each location



11/15/17

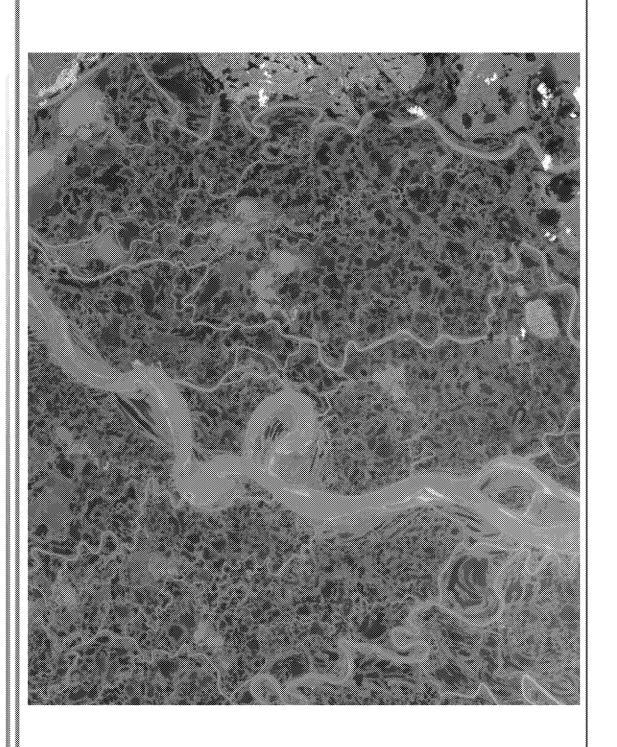
MAGOTHY AQUIFER - GEOLOGIC COMPLEXITY





MODERN EQUAL — MACKENZIE RIVER DELTA

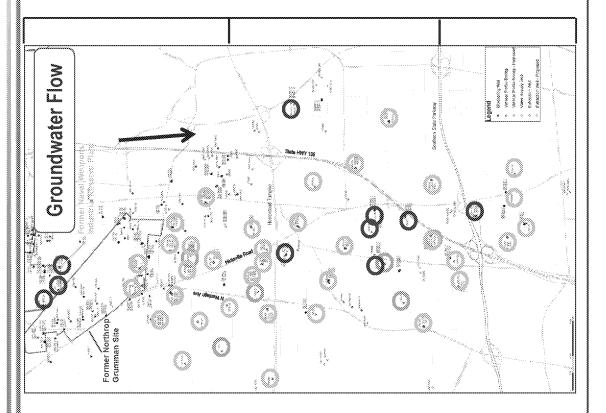




VERTICAL PROFILE BORINGS AND WELLS 2002 - 2014



North of Hempstead Tumpike Area North of Southern State Parkway Area



2010 to 2012

(3) (3) (3)

Completed

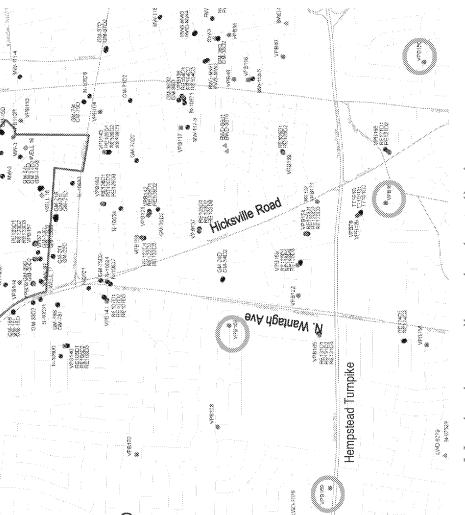
South of Southern State Parkway Area

VERTICAL PROFILE BORINGS & MONITORING WIELS



Pamed work through November 2018;

- Operation of 2 drilling rigs
- Installation of Vertical Profile Borings
- 1 north of Hempstead Turnpike Area (To be sited),
- 4 north of Southern State Parkway Area (To be sited)
- Installation of Monitoring Wells
- 4 north of Hempstead Turnpike Area
- 6 north of Southern State Parkway
- Installation of 1 Recovery Well and associated VPB North of Hempstead Turnpike (To be sited)
- Continue quarterly groundwater sampling

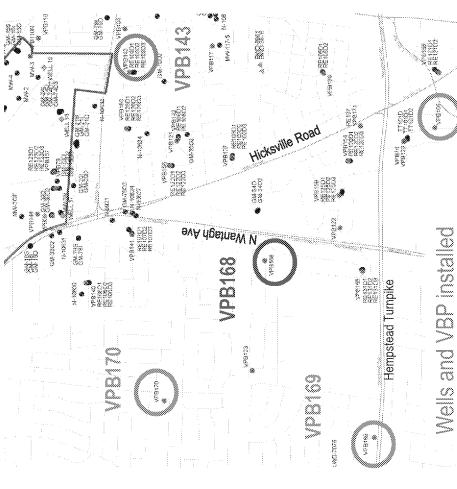


Monitoring wells to be installed



From April 2017 (last RAB) to present

- Operation of 1 drilling rig
- North of Hempstead Turnpike
- Installation of 3 monitoring wells associated with VPB143
- •Installation of four VPBs (VPB143, VPB166, VPB166) (VPB170)
- Currently installing VPB168
- Completion of 2 rounds of quarterly groundwater sampling (June and September)
- Completion of one round of water level measurements in September.



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Jurent Drilling Location (YPB)

0

ASSESSING GROUNDWATER RESULTS



Laboratory analysis is performed for multiple volatile organic compounds.

The primary contaminant being used to track the plume is trichloroethene (TCE) because it has the highest concentrations.

- Acceptable Maximum Contaminant Limit (MCL) is a limit established by Federal and State regulations
- The MCL for trichloroethene is 5 parts per billion

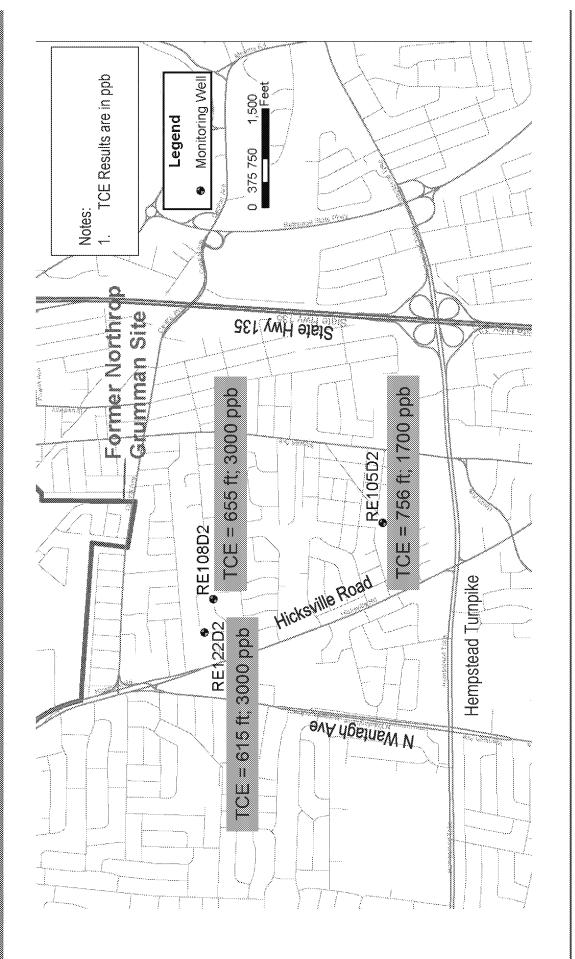
Hotspot Identification:

As defined in the Operable Unit 2 Offsite Groundwater 2003 Record of Decision, an area with >1,000 parts per billion of total volatile organic Somboames

11/15/17

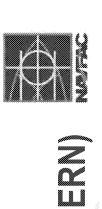
PRICHLOROFIHENE RESULTS OVER 1,000 PPB JUNE 2017 GROUNDWATER SAMPLING

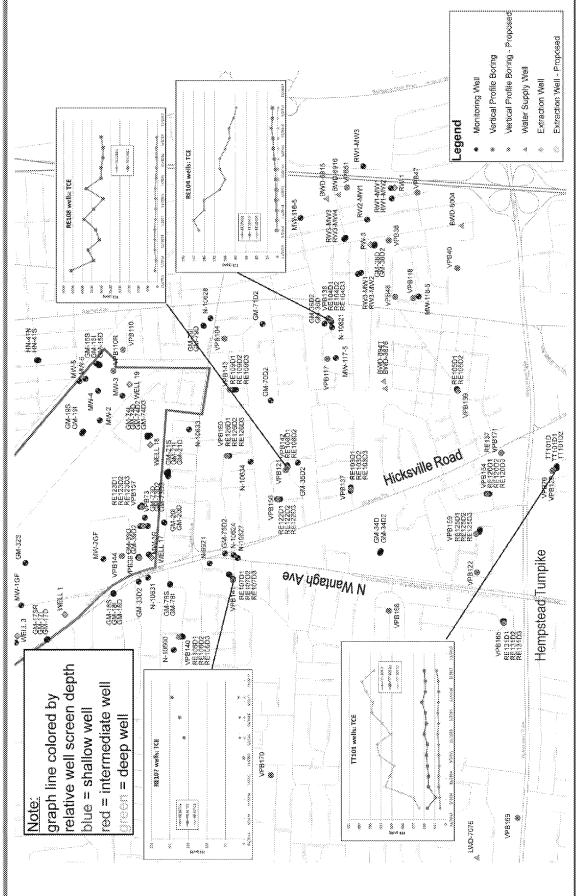




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QUARTERLY GROUNDWATER SAMPLING (NORTHERN) RECEINT TRENDS IN REIOR HOTSPOT FROM

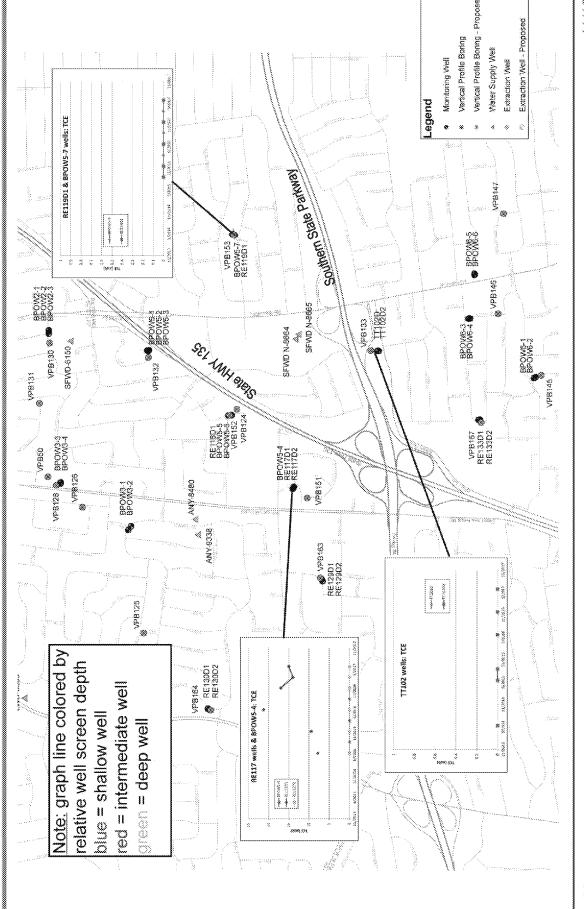




11/15/17

QUARTERLY GROUNDWATER SAMPLING (SOUTHERN) RECENT TRENDS IN RETURN SPOT FROM





OUZ GROUNDWATER OBJECTIVES RESULTS



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Objective 1 - Protection of Public Water Supply Wells:

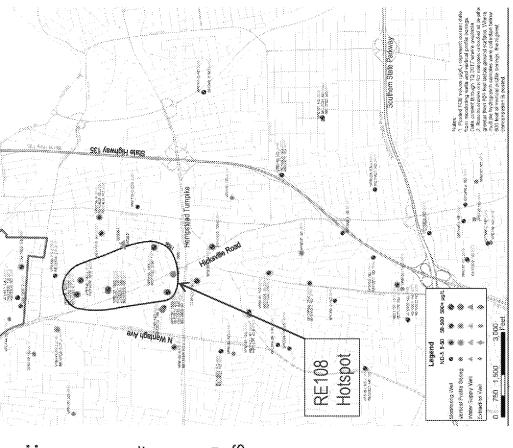
Outpost wells installed and are sampled regularly.

Objective 2 - Characterization of the OU2 Plume:

- RE108 Hotspot has been identified by latest phase of Navy drilling program;
- Trichloroethene found above 1,000 parts per billion in the area North of Hempstead Tumpike Area at depths greater than 600 feet;
- Ongoing VPB and well installation to complete delineation of overall plume;
- Ongoing quarterly groundwater sampling.

Objective 3 - Well Containment Analysis:

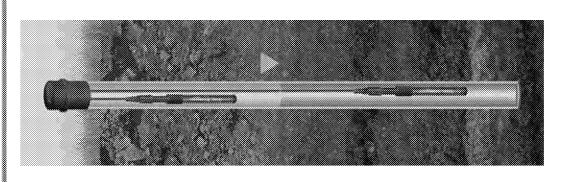
Treatment options are being evaluated to address potential impacts to public water supply wells and to address RE108 Hotspot.



SOUTH FARMINGDALE WATER DISTRICT & NEW YORK AMERICAN MATER WELL CONTAINMENT ANALYSIS



- Purpose of work is to identify the well containment zones of the South Farmingdale Water District (SFWD) Plant 6 wells and the New York American Water (NYAW) wells;
- February 2017 May 2017 water level changes were recorded in key wells south of Hempstead Turnpike
- Groundwater modeling will be completed in Fall and Winter





SITE 4 - FORMER UNDERGROUND STORAGE TANKS

NOVEMBER 2017 RESTORATION ADVISORY BOARD

NAVAL WEARONS INDUSTRIAL RESERVE PLANT BETHPAGE

110001

PRESENTATION LAYOUT



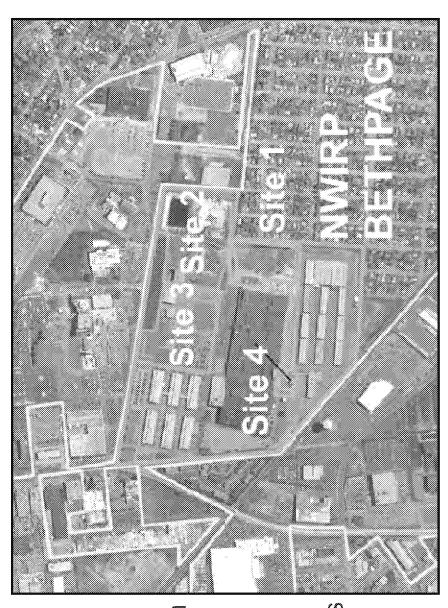
Site 4 - Former Underground Storage Tanks

- Site Overview
- 2. Selected Remedy
- 3. Remedy Construction and Schedule

SITE OVERVIEW

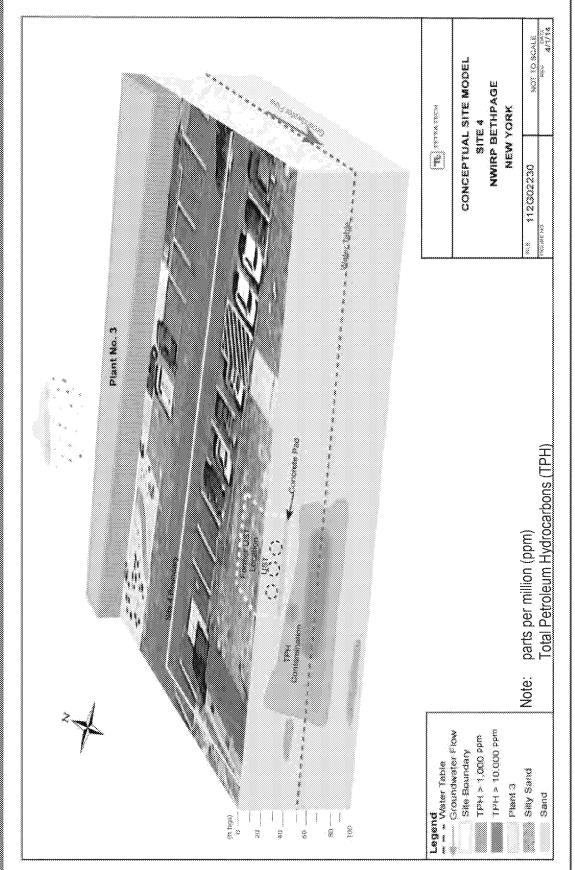


- Area: 1/4 acre
- Three Underground Storage Tanks
- Stored No. 6 Fuel Oil to fire boilers located in Plant 3 from 1941 1966
- 1966 early 1980s stored Excess No. 4 Fuel Oil
- Tanks removed in early 1980s



SITE OVERVIEW

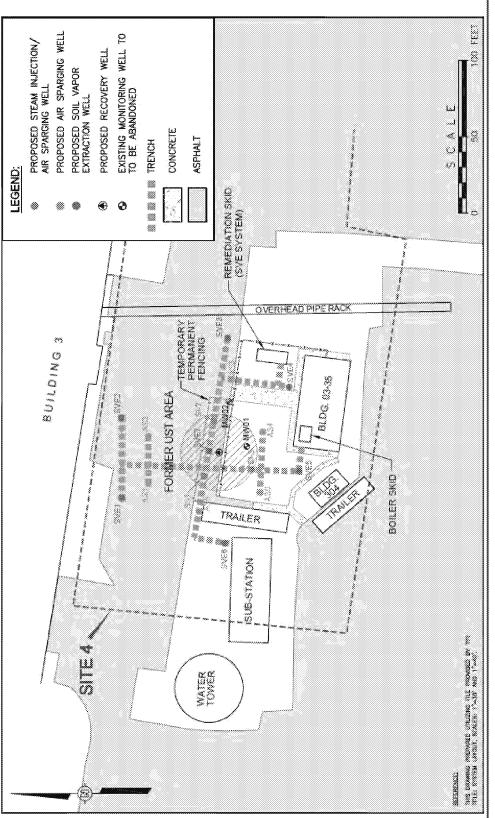




SELECTED REMEDY



 2015 Record of Decision for Operable Unit 3 (OU3): Steam Injection, Free Product Recovery, Biosparging, and Soil Vapor Extraction with Treatment



REMEDY CONSTRUCTION AND SCHEDULE



- All Wells Installed as of 10/27/17
- Remediation System Components
 On-site
- December 2017: Initiate Steam Injection and Free Product Recovery
- Expected to Operate for 8 Months
- Summer 2018: Transition to Biosparge System with Treatment
- Expected to Operate for 4 Years



 Note: Soil Vapor Extraction System Will Operate During Both Steam Injection and **Biosparge Phases**



RE108 AREA HOTSPOT TREATMENT SYSTEM

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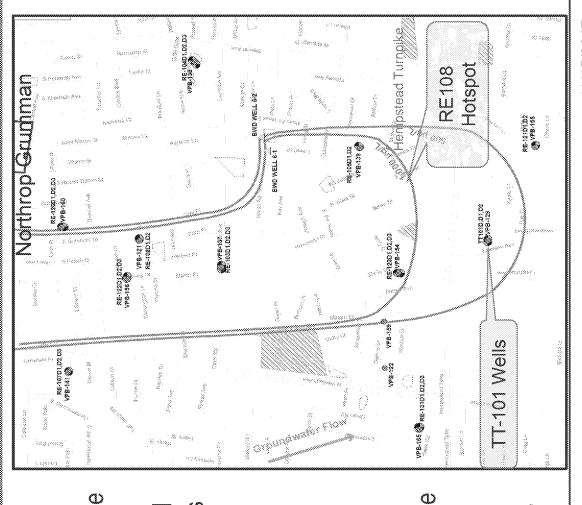
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RETURNOTISPOT AREA INVESTIGATION

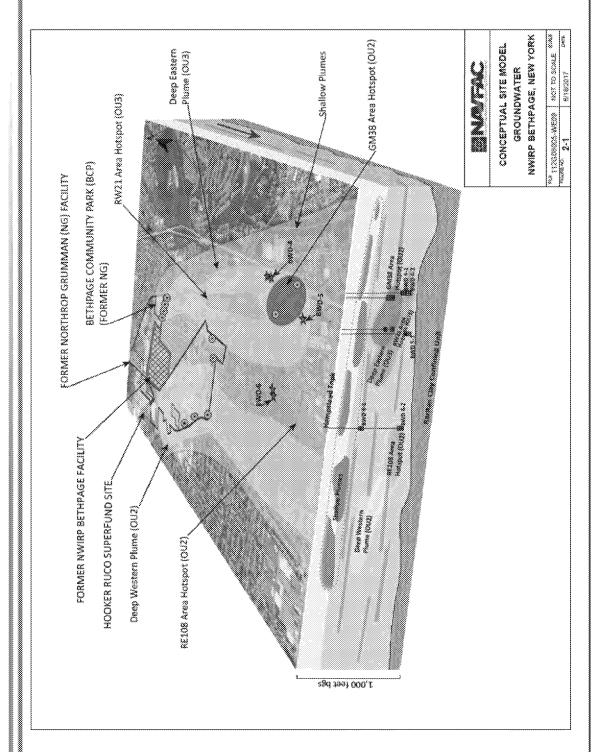


- Vertical profile boring and monitoring well investigations are ongoing to define and monitor the RE108 Area Hotspot
 - and monitor the RE108 Area Hotspot
 A Hotspot is defined as containing total site-related volatile organic compounds (VOCs) greater than 1,000 parts per billion (ppb) over a sustained period
 - In practice, a remedy will also address areas in close proximity that also contain lower concentrations of VOCs (e.g., 500 ppb)
- The Hotspot is deep, and does not have an effect on the residents in the area
 - The water districts are aware of it, and monitor and treat the water supplies as needed to comply with standards



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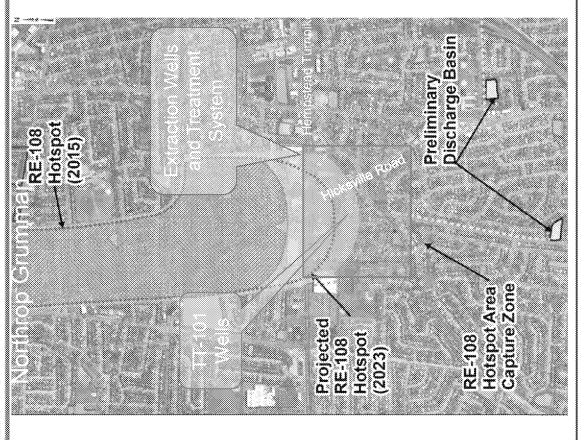
RE108 AREA HOTSPOT OVERVIEW



 To accelerate cleanup, work is being conducted in phases

Phase II - Contain the plume

- Navy is designing a groundwater extraction, treatment, and discharge system to capture the RE108 Area Hotspot groundwater near the downgradient edge
- System is expected to extract 1.3 to 1.7 million gallons per day (MGD) of groundwater
- Air Stripping and Granular Activated Carbon (air and water) will be used
- Water will be treated to Drinking Water Standards
- The equipment and tanks will be enclosed in an approximate 80 feet by 100 feet by 25 feet high building
- Buffers (minimum of 100 feet) to occupied structures will be used, 2 acres is required



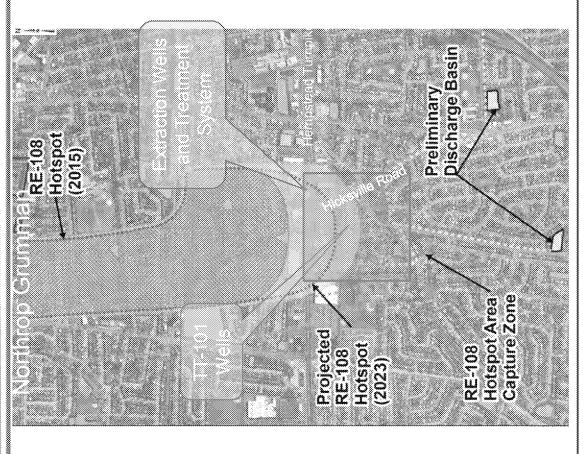
RE108 AREA HOTSPOT OVERVIEW



Plase = Status

- The 30 Percent Design (Phase III) is anticipated for early 2018
- Other design activities including pilot-scale treatability testing and basin infiltration tests are being conducted
- Navy is actively pursing property access to construct the treatment system
- construct the treatment system

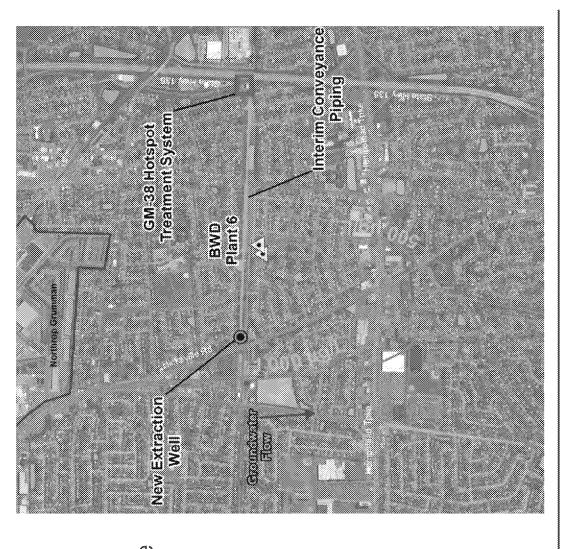
 Property access will also be required for the extraction wells, conveyance piping, and discharge
- Groundwater is slowly moving to the south, therefore extraction and treatment system is based on the anticipated location of hotspot in 2022
- Because of this timing, the Navy is also constructing a Phase I System that maximizes use of existing open space and treatment facilities





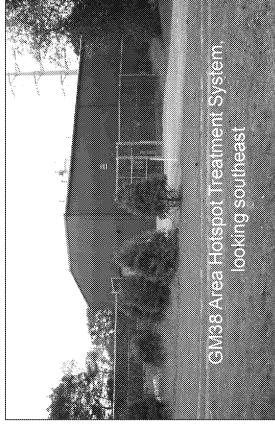
Phase Status

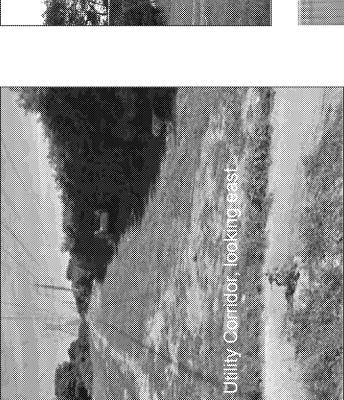
- A 30 Percent Design was completed in
- extraction well and double wall piping to the The Phase I System would consist of an Navy's existing GM38 Area Hotspot Treatment System October 2017
- The well would operate at 0.3 to 0.6 MGD
- Based on property access requirements, design and construction could be completed within 1.5 years
- remove significant solvent mass from the Hotspot groundwater migration rate and Operations would reduce RE108 Area groundwater
- Its operation would also accelerate overall groundwater cleanup times



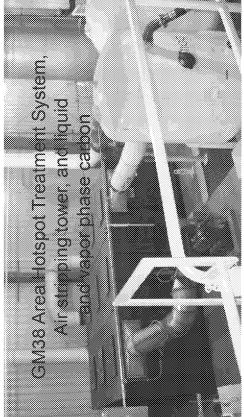
HOTSPOT TREATMENT SYSTEM







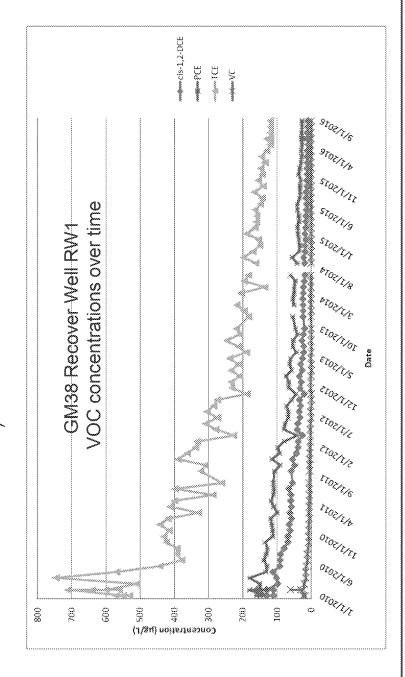
 The new well and piping would use the existing utility corridor and GM38 Area Hotspot Treatment System



HOTSPOT TREATMENT SYSTEM



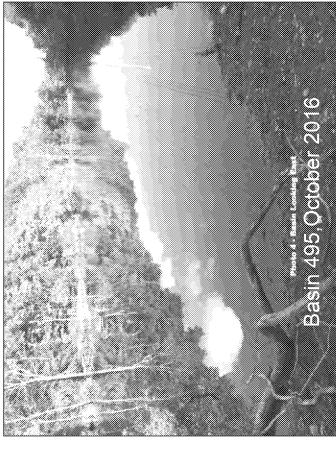
- The existing GM38 Area Hotspot is operating below its capacity for treating VOCs
- Treatment System is designed for TCE at 3,400 ppb
- In September 2017, TCE is at 95 ppb
- 0.3 to 0.5 MGD of Phase I RE108 water would be blended with 0.9 to 1.2 MGD of GM38 RW1 water (total flow would remain the same)

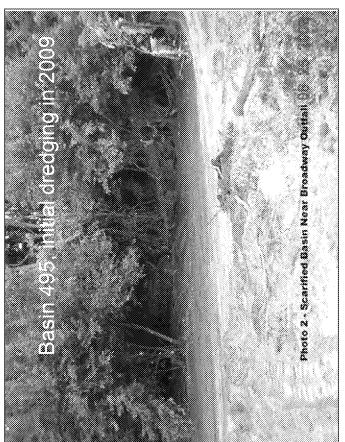


HOTSPOT TREATMENT SYSTEM



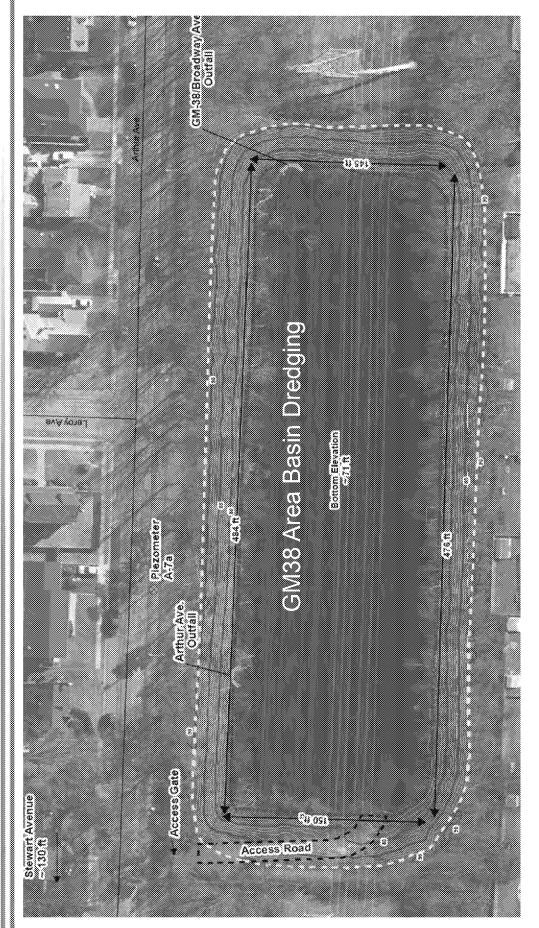
- The existing Recharge Basin (NC 495) would be used
- Navy will be cleaning the basin in the next few weeks 2,000 tons of soil and trash to be
- Navy is also evaluating the use of injection wells to reduce flow into the existing basin





TREATMENT SYSTEM DREDGING PROJECT GM38 AREA HOTSPOT







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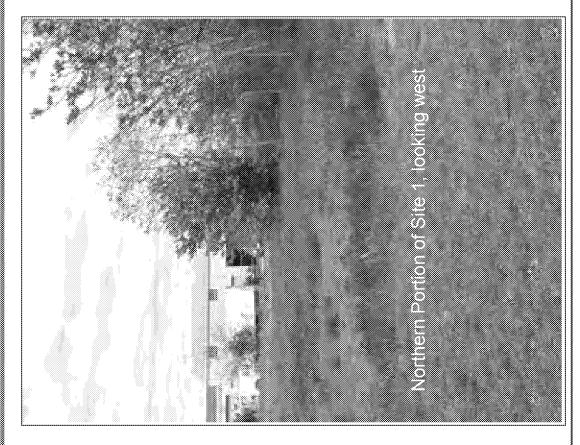
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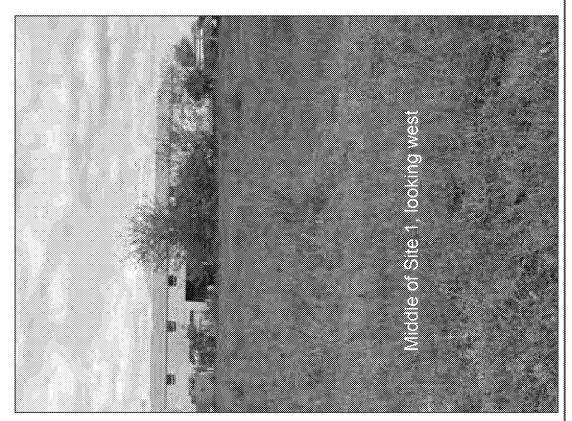


- Two former drum marshalling pads
- 120 abandoned cesspools for sanitary waters from Plant 3
- AOC) 34-07 and AOC 20-08 for storm water
 - AOC 23-Former
 Aboveground Storage Tanks (ASTs)
- AOC 35-Former Sludge Drying Beds
 - AOC 30-Storage Sheds

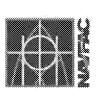




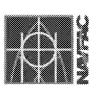




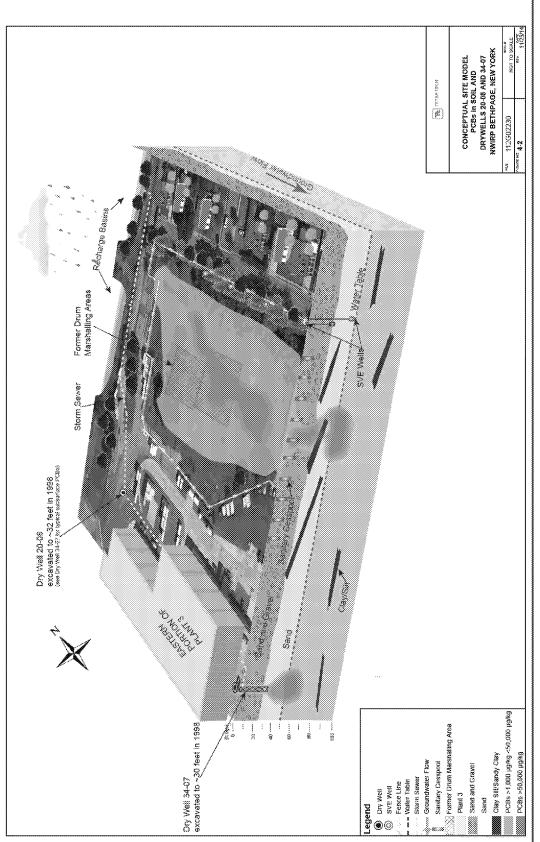
SITE I MEDIA AND CHEMICALS



- Media and chemicals to be addressed:
- -Soil: Polychlorinated biphenyls (PCBs), chlordane, polynuclear aromatic hydrocarbons (PAHs), metals
- -Groundwater: PCBs and hexavalent chromium
- -Soil Vapor (Vapor Intrusion): Tetrachloroethene and trichloroethene







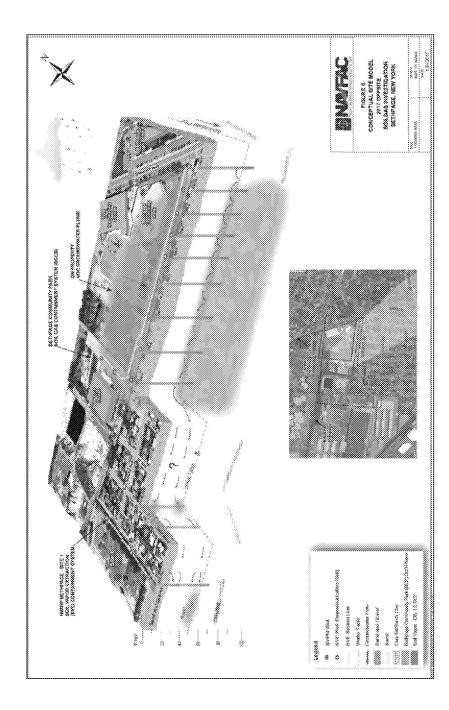
SITE 1 SOIL GAS INVESTIGATION



- Site 1 Soil Vapor

 Extraction

 Containment System
 is continuing to
 operate effectively
 - Recently, higher levels of VOCs were noted in one of the deeper vapor probes
- Does not represent a concern for residents, but may have an effect on the operation of the Containment System







 Navy will be conducting a oneweek investigation in the area to evaluate deep soil gas

SITE 1 PROPOSED PLAN



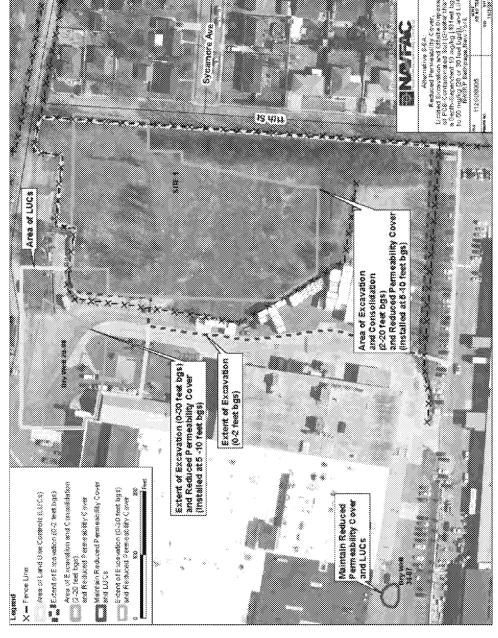
Proposed Soil Remedy

S-6A: Reduced
Permeability Cover,

Excavation and Offsite Disposal of PCB-

Contaminated Soil (Greater than a Depth-Dependent 10 parts per

million (ppm) - Maximum of 10 feet below ground surface [bgs] to 50 ppm Maximum of 20 or 30 feet bgs), and Land Use



SITE 1 PROPOSED PLAN



Proposed Groundwater Remedy

• G-2: Monitoring and Land Use Controls



SITE 1 PROPOSED PLAN



Proposed Soil Vapor

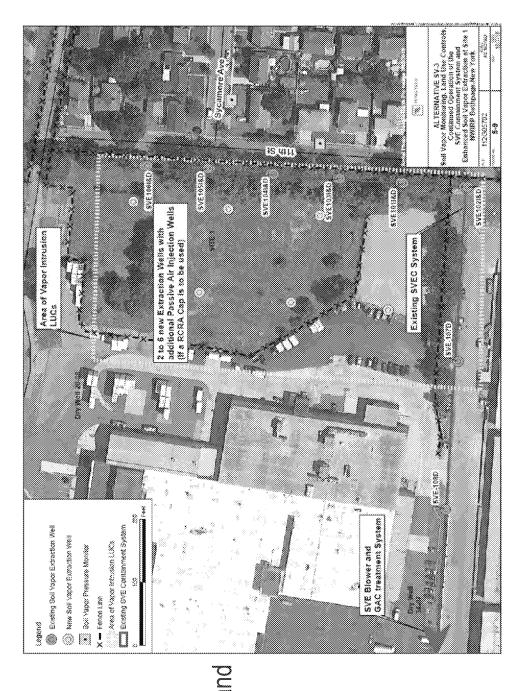
SV-3: Soil Vapor

Monitoring, Land Use

Controls, Continued

Operation of the SVE

Containment System, and Enhanced Soil Vapor Extraction at Site 1



SITE 1 PATH FORWARD



- 2017 Proposed Plan (60-day public comment period)
- Public Meeting in Dec 2017/ Jan 2018 (to be announced)
- 2018 Record of Decision
- 2018 Design
- 2018 Start Cleanup